

# City of Brockton Contributory Retirement System

## Actuarial Valuation Report

Plan Year as of January 1, 2016

September 2016



# Table of Contents

## Sections

I	Overview.....	1
II	Summary Of Principal Results .....	3
III	Membership Data .....	4
IV	Assets.....	5
V	Contributions Payable Under The System .....	6
VI	Accounting Information.....	8

## Schedules

A	Actuarial Assumptions And Methods .....	21
B	Summary Of System Provisions.....	23
C	Membership Tables .....	26
D	Valuation Results By Group .....	28
E	Projection Of Expected Pension Payments .....	31
F	GASB 68 Information .....	32
G	Net Pension Liability Allocations as of June 30, 2015 and June 30, 2016 by Employer .....	36
H	Allocations of Pension Amounts as of June 30, 2016 by Employer .....	37
I	Employers' Proportionate Share of the June 30, 2016 Deferred Outflows/Inflows .....	38

## Section I - Overview

The City of Brockton Retirement Board has engaged Buck Consultants to prepare an actuarial valuation of the Retirement System as of January 1, 2016. Employee data and asset information used in the valuation were provided by the Retirement Board.

The valuation was prepared pursuant to Chapter 32 of the Massachusetts General Laws, based upon the acceptance of Section 22D.

The purposes of the valuation are to:

- 1) analyze the current funded position of the System and determine the level of contributions necessary to assure sound funding;
- 2) update the Section 22D funding schedule currently in place for the Retirement System; and
- 3) provide reporting and disclosure information for financial statements, governmental agencies and other interested parties.

Use of this report for any other purpose may not be appropriate and may result in mistaken conclusions due to failure to understand applicable assumptions, methodologies, or inapplicability of the report for that purpose. Buck should be asked to review any statement to be made on the basis of the information presented in this report. Buck will not accept any liability for any such statement made without prior review by Buck.

Schedule A of this report outlines the actuarial assumptions and methods used in the valuation. All assumptions are the same as those used in the previous valuation. The economic assumptions are based upon a review of the current portfolio structure and economic environment and represent expectations with respect to future experience.

Section II provides a summary of the principal valuation results. Section V provides a projection of the Section 22D funding amounts.

Where presented, references to "funded ratio" and "unfunded accrued liability" typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e., purchase annuities) for a portion or all of its liabilities.

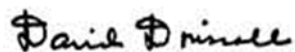
Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, changes expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions, applicable law or regulations. An analysis of the potential range of such future differences is beyond the scope of this valuation.

## Section I – Overview (continued)

This report fairly represents the actuarial position of the City of Brockton Retirement System as of January 1, 2016, in accordance with generally accepted actuarial principles applied consistently with the preceding valuation. In our opinion, the actuarial assumptions used to compute actuarial accrued liability and normal cost are reasonably related to plan experience and to reasonable expectations, and represents our best estimate of anticipated plan experience. The valuation was performed by, and under the supervision of, actuaries who have experience in performing valuations for public retirement systems. We are both Members of the American Academy of Actuaries and meet the Academy's Qualification Standards to issue this Statement of Actuarial Opinion and are available to answer any questions regarding the results.

Respectfully Submitted,

BUCK CONSULTANTS, LLC



9/6/2016

---

David L. Driscoll, FSA, MAAA, EA  
Principal, Retirement

---

Date



9/6/2016

---

Hilja Viidemann, FSA, MAAA, EA  
Senior Consultant, Retirement

---

Date

DLD/HV/jac  
Brockton1.1.2016 val\_signed.docx

## Section II - Summary Of Principal Results

1. For convenience of reference, the principal results of the valuation as of January 1, 2016 are summarized below along with a comparison with the amounts in the previous valuation as of January 1, 2015.

Valuation Date	January 1, 2015 <sup>1</sup>	January 1, 2016
a) Active Members:		
Number	1,730	1,756
Annual compensation	\$ 73,756,821	\$ 89,738,426
Average age	46.5	46.7
Average service	11.6	11.6
Average compensation	\$ 42,634	\$ 51,104
b) Pensioners and beneficiaries:		
Number	1,261	1,270
Annual benefit payments	\$ 36,565,555	\$ 38,803,087
Average benefit	\$ 28,997	\$ 30,554
c) Inactive employees:		
Number	394	502
Accumulated employee contributions	\$ 2,078,515	\$ 3,405,428
d) Actuarial accrued liability	\$ 554,569,401	\$ 590,910,301
e) Market value of assets	\$ 371,991,381	\$ 352,477,755
f) Assets for valuation purposes	\$ 373,185,143	\$ 380,329,008
g) Unfunded actuarial accrued liability (d. – f.)	\$ 181,384,258	\$ 210,581,293
h) Funded percentage (f. / d.)	67.29%	64.36%
i) Section 22D funding for fiscal 2017	\$ 19,289,967	\$ 21,207,788
j) Section 22D funding for fiscal 2018	\$ 21,207,788	\$ 25,014,425

A projection of Section 22D costs is presented in Section V. Schedule A of this report outlines the actuarial assumptions and methods employed. The provisions of the System are summarized in Schedule B. The valuation includes additional liabilities resulting from Chapter 17 COLA legislation.

<sup>1</sup> Census information is as of January 1, 2014 and projected to the valuation date using the plan's demographic assumptions assuming no gains or losses.

## Section III - Membership Data

In order to calculate the aggregate liabilities and assets on account of members of the System as of January 1, 2016, data was needed with respect to each active and retired member and beneficiary of the System. The data with respect to active, retired and terminated members and beneficiaries were furnished to the actuary by the Retirement Board.

From the data, tabulations were made showing, as of January 1, 2016, the number and annual compensation of active members classified by age and years of service and the number and annual retirement allowances of retired members and beneficiaries as of January 1, 2016, classified by age. These tables are presented in Schedule C.

The following tables show the number of active and retired members of the Retirement System as of January 1, 2016.

**Table I - The Number and Annual Compensation of Active Members as of January 1, 2016**

Group	Number	Compensation
General employees	1,406	\$ 55,487,242
Police and Fire	350	\$ 34,251,184
Total	1,756	\$ 89,738,426

**Table II - The Number and Annual Retirement Allowances of Retired Members and Beneficiaries as of January 1, 2016**

Annual Retirement Allowance		
Group	Number	Pension <sup>1</sup>
Service Retirements	886	\$ 26,203,059
Disability Retirements	187	\$ 8,906,591
Beneficiaries of Deceased Members	197	\$ 3,693,437
Grand Total	1,270	\$ 38,803,087

In addition, there are 502 members with estimated deferred benefits valued at \$3,405,428.

<sup>1</sup> Pension amounts exclude cost-of-living adjustments applied after July 1, 1981, and prior to July 1, 1998, which are funded by the Commonwealth of Massachusetts.

## Section IV - Assets

The amount of assets taken into account in this valuation is based on financial information reported by the Retirement Board. As of January 1, 2016, the reported market value of Retirement System assets amounted to \$352,477,755. The actuarial value of assets for valuation funding purposes is \$380,329,008. Valuation assets are developed using a smoothing method (described in Schedule A of this report) in order to smooth the year-to-year fluctuations due to deviations of investment returns from expected levels.

1. Market value of plan assets, January 1, 2015		\$ 371,991,381
2. Employer and employee contributions, net transfers and reimbursements	28,301,551	
3. Expenses	(686,453)	
4. Benefits and refunds	(39,574,285)	
5. Expected interest during the year	29,280,943	
6. Expected market value of plan assets, January 1, 2016		\$ 389,313,137
7. Actual market value of plan assets, January 1, 2016		352,477,755
8. Investment gain/(loss) during 2015 [7. – 6.]	(36,835,382)	
9. Investment gain/(loss) during 2014	(8,878,778)	
10. Investment gain/(loss) during 2013	11,975,626	
11. Investment gain/(loss) during 2012	10,770,348	
12. Tentative Valuation Assets before reflecting 80% - 120% corridor = [7. – 80% x 8. – 60% x 9. – 40% x 10. – 20% x 11.]		\$ 380,329,008
13. 80% of actual market value = 80% x 7.		281,982,204
14. 120% of actual market value = 120% x 7.		422,973,306
15. Valuation Assets = 12. But not less the 13. or greater than 14.		\$ 380,329,008

## Section V - Contributions Payable Under the System

Section 22D of MGL Chapter 32 outlines various requirements of a funding schedule that will amortize the unfunded actuarial liability and cover normal costs. The normal cost and unfunded actuarial liability are to be calculated in accordance with the individual entry-age-normal actuarial cost method. The contribution toward amortization of the unfunded actuarial liability may increase by up to 4½% each year.

The following table presents a projection of contributions that satisfy the Section 22D requirements. The normal cost is assumed to increase by 4% annually while the unfunded accrued liability contribution is based on a 4½% annual increase and is assumed to be paid mid-year. This schedule incorporates the funding required to provide annual COLAs under Chapter 17 of the Acts of 1997.

Please note that the amounts shown in the following schedule for the 2017 fiscal year represent the actual amounts already appropriated by the City for the 2017 fiscal year.

The 2018 appropriation is approximately \$2.9 million, or 13%, higher than the amount shown in the 2015 valuation report. This is the result generally adverse actuarial experience and the primary factors leading to the increase are the following:

1. Less-than-expected asset return. Actual return on market value of assets in 2015 was (2.06%). This accounts for approximately \$0.9 million of the increase.
2. Unfavorable demographic experience, most notably pay increases that were greater than expected. For continuing active participants (active in both 2014 and 2016), pays increased on average at 8.3% per year. This accounts for approximately \$1.3 million of the increase.
3. Other demographic experience with respect to mortality, termination, retirement and rehire experience increased the contribution by \$0.7M
4. These experience related factors, along with the increase in the value of benefits accruing as a result of the increased salary levels result in the aggregate increase in the budgeted contribution levels.

Note that the aggregate budgeted contribution actually decreases as a percentage of the covered payroll.



## Section V - Contributions Payable Under the System (continued)

### Pension Reform Act - Section 22D Funding Requirements

Fiscal Year Ending In	Normal Cost	<u>Amortization of the Unfunded Actuarial Liability</u>			Total City Contribution
		UAL	1992 ERI	Total Payment	
2017	6,020,998	15,114,354	72,436	15,186,790	21,207,788
2018	6,392,641	18,549,348	72,436	18,621,784	25,014,425
2019	6,573,147	19,384,069	72,436	19,456,505	26,029,652
2020	6,757,866	20,256,352	0	20,256,352	27,014,218
2021	6,946,845	21,167,888	0	21,167,888	28,114,733
2022	7,140,129	22,120,442	0	22,120,442	29,260,571
2023	7,337,760	23,115,862	0	23,115,862	30,453,622
2024	7,539,779	24,156,076	0	24,156,076	31,695,855
2025	7,746,217	25,243,100	0	25,243,100	32,989,317
2026	7,957,108	26,379,039	0	26,379,039	34,336,147
2027	8,172,476	27,566,096	0	27,566,096	35,738,572
2028	8,392,342	28,806,571	0	28,806,571	37,198,913
2029	8,616,722	30,102,866	0	30,102,866	38,719,588
2030	8,845,623	31,457,495	0	31,457,495	40,303,118
2031	9,079,051	32,873,083	0	32,873,083	41,952,134
2032	9,317,000	24,329,400	0	24,329,400	33,646,400
2033	9,559,459	0	0	0	9,559,459
2034	9,806,406	0	0	0	9,806,406
2035	10,057,814	0	0	0	10,057,814
2036	10,313,644	0	0	0	10,313,644
2037	10,573,849	0	0	0	10,573,849
2038	10,838,367	0	0	0	10,838,367
2039	11,107,129	0	0	0	11,107,129
2040	11,551,415	0	0	0	11,551,415
2041	12,013,472	0	0	0	12,013,472
2042	12,494,011	0	0	0	12,494,011
2043	12,993,771	0	0	0	12,993,771
2044	13,513,522	0	0	0	13,513,522
2045	14,054,063	0	0	0	14,054,063
2046	14,616,226	0	0	0	14,616,226
2047	15,200,876	0	0	0	15,200,876

## Section VI – Accounting Information

Information required under Statement No. 67 of the Governmental Accounting Standard Board (GASB) is shown below:

### A. Summary of Significant Accounting Policies

#### Method used to value investments.

Investments are reported at fair value.

### B. Plan Description

#### Plan administration

The City of Brockton, Massachusetts, administers the Contributory Retirement System (Plan), a defined benefit pension plan that covers all employees of participating units except teachers, elected officials and those employees in service at the time of its establishment who elected not to become members. Eligible employees in the City who enter service on or after the date the System became operative for their classification may become members of the Retirement System on their own application.

#### Plan membership

Plan membership is summarized in Section III.

#### Benefits provided

Please see Schedule B of the report for a summary of plan provisions.

#### Contributions

The City establishes contributions based on an actuarially determined contribution recommended by an independent actuary. The actuarially determined contribution is developed using the Entry Age Normal Actuarial Cost Method. For the sponsor fiscal year ended June 30, 2016, the City contributed \$19,247,619 to the plan.

### C. Investments

#### Rate of return

For the year ended December 31, 2015, the annual money-weighted rate of return on pension plan investments, net of pension plan investment expense, was (2.06%). The money-weighted rate of return expresses investment performance, net of investment expense, adjusted for the changing amounts actually invested.

### D. Receivables

No receivable contributions have been included in plan assets.

## Section VI – Accounting Information (continued)

### E. Net Pension Liability

The components of the net pension liability at December 31, 2015, were as follows:

Components of Net Pension Liability	
Total pension liability	\$ 590,910,301
Plan fiduciary net position	(352,477,755)
City's net pension liability	\$ 238,432,546
Plan fiduciary net position as a percentage of the total pension liability	59.65%

### F. Actuarial assumptions

The total pension liability was determined by an actuarial valuation as of December 31, 2015, using the following actuarial assumptions, applied to all periods included in the measurement. The assumptions used to develop the figures presented for GASB 67 and 68 are the same as those set forth in Schedule A of the report except where noted:

Actuarial Assumptions	
Inflation	3.00%
Salary Increases	See page 21
Investment rate of return	8.00%, net of pension plan investment expenses. This is based on an average inflation rate of 3.00% and a real rate of return of 5.00%.

The mortality assumption applicable to non-disabled participants is the RP-2000 Mortality Table projected generationally with Scale BB for males and females.

The long-term expected rate of return on Fund investments was determined using best-estimate ranges of expected future nominal rates of return (expected returns, net of investment expense and inflation) developed for each major asset class using an econometric model that forecasts a variety of economic environments and then calculates asset class returns based on functional relationships between the economic variables and the asset classes. Best estimates of arithmetic rates of return for each major asset class included in the pension plan's target asset allocation as of December 31, 2014 are summarized in the following table:

Asset Class	Long-Term Expected Real Rate of Return
Equity	8.46%
Fixed income	1.83%
Alternatives	7.92%

Nominal long-term expected rates of return for these asset classes are equal to the sum of the above expected long-term real rates and the expected long-term inflation rate of 3.00%.

## Section VI – Accounting Information (continued)

### Discount rate

The discount rate used to measure the total pension liability was 8.00%. The projection of cash flows used to determine the discount rate assumed that contributions will continue to follow the pattern of contributions observed over the last five years. During that period, the City contributed 100% of the cumulative recommended contribution level. Accordingly, the fiduciary net position was projected assuming that 100% of future recommended contribution levels will be contributed. Based on those assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Had the fiduciary net position been projected to be depleted, a municipal bond rate of 3.20% would have been used in the development of the blended GASB discount rate after that point. The 3.20% rate is based on the S&P Municipal Bond 20 Year High Grade Rate Index.

### Sensitivity of the net pension liability to changes in the discount rate

The following presents the net pension liability, calculated using the discount rate of 8.00%, as well as what the net pension liability would be if it were calculated using a discount rate that is 1-percentage-point lower (7.00%) or 1-percentage-point higher (9.00%) than the current rate:

	1% Decrease (7.00%)	Current Discount Rate (8.00%)	1% Increase (9.00%)
Net Pension Liability	\$299,835,510	\$ 238,432,546	\$186,058,931

## Section VI – Accounting Information (continued)

### Schedules of Required Supplementary Information

#### Schedule of Changes in Net Pension Liability and Related Ratios

	2016
<b>Total pension liability</b>	
Service cost	\$ 11,641,512
Interest	44,359,746
Changes of benefit terms	0
Differences between expected and actual experience	11,431,816
Changes of assumptions	0
Benefit payments	<u>(38,024,658)</u>
Net change in total pension liability	\$ 29,408,416
Total pension liability-beginning	\$ 561,501,885
Total pension liability-ending (a)	\$ 590,910,301
<b>Plan fiduciary net pension</b>	
Contributions-employer	\$ 19,247,619
Contributions-employee	8,302,780
Net investment income	(7,554,439)
Benefit payments, including refunds of employee contributions	(38,024,658)
Administrative expense	(686,453)
Other	<u>(798,475)</u>
Net change in plan fiduciary net position	\$ (19,513,626)
Plan fiduciary net position-beginning	\$ 371,991,381
Plan fiduciary net position-ending (b)	\$ 352,477,755
Net pension liability-ending (a)-(b)	\$ 238,432,546
Covered payroll	\$ 89,738,426
Net pension liability as a percentage of payroll	265.70%

#### Notes to Schedule:

##### A. Benefit changes

None.

##### B. Changes of assumptions

There were no changes in assumptions in determining the Total Pension Liability at December 31, 2015.

## Section VI – Accounting Information (continued)

### Schedules of Required Supplementary Information (continued)

#### Schedule of Contributions

	2016	2015
Actuarially determined contribution	\$21,207,788	\$19,289,967
Contributions related to the actuarially determined contribution	(19,247,619)	(19,333,315)
Contribution deficiency (excess)	\$ 1,960,169	\$ (42,348)

#### Notes to Schedule:

##### A. Valuation date

Actuarially determined contribution rates are calculated as of January 1 in the fiscal year preceding the fiscal year in which contributions are made. That is, the contribution calculated as of January 1, 2016 will be made during the fiscal year ended June 30, 2017.

##### B. Methods and assumptions used to determine contribution rates:

Please see Schedule A of the report.

#### Schedule of Investment Returns

	2015	2014
Annual money-weighted rate of return, net of investment expenses	(2.06%)	4.38%

## Section VI – Accounting Information (continued)

Table 1 - Projection of Fiduciary Net Position (000's omitted)

Fiscal Year Ending 6/30	Beginning Fiduciary Net Position	Member Contributions	Employer Contributions	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Net Position
2017	\$ 352,478	\$ 7,951	\$ 23,828	\$ 44,357	\$ 680	\$ 27,668	\$ 366,887
2018	\$ 366,887	7,738	24,833	42,383	651	28,933	385,358
2019	\$ 385,358	7,519	26,131	43,985	630	30,390	404,783
2020	\$ 404,783	7,309	27,653	45,472	609	31,938	425,601
2021	\$ 425,601	7,088	29,165	46,982	588	33,595	447,880
2022	\$ 447,880	6,858	29,890	48,620	567	35,333	470,773
2023	\$ 470,773	6,633	30,777	50,152	546	37,130	494,615
2024	\$ 494,615	6,395	31,723	51,695	525	39,005	519,518
2025	\$ 519,518	6,141	32,699	53,365	504	40,960	545,449
2026	\$ 545,449	5,877	33,745	54,996	481	43,002	572,596
2027	\$ 572,596	5,587	34,835	56,702	457	45,138	600,997
2028	\$ 600,997	5,322	36,057	58,299	433	47,386	631,029
2029	\$ 631,029	5,051	37,357	59,877	411	49,767	662,916
2030	\$ 662,916	4,798	38,728	61,302	388	52,307	697,058
2031	\$ 697,058	4,538	40,162	62,719	367	55,029	733,702
2032	\$ 733,702	4,284	30,149	64,015	346	57,499	761,272
2033	\$ 761,272	4,027	1,570	65,262	325	58,502	759,786
2034	\$ 759,786	3,776	1,372	66,375	304	58,322	756,576
2035	\$ 756,576	3,519	1,175	67,381	284	58,007	751,613
2036	\$ 751,613	3,235	953	68,451	264	57,548	744,634
2037	\$ 744,634	2,977	766	69,174	242	56,944	735,905
2038	\$ 735,905	2,733	620	69,770	222	56,207	725,473
2039	\$ 725,473	2,502	491	70,155	203	55,343	713,453
2040	\$ 713,453	2,293	388	70,282	186	54,365	700,032
2041	\$ 700,032	2,092	298	70,234	170	53,282	685,301
2042	\$ 685,301	1,895	218	70,047	154	52,100	669,312
2043	\$ 669,312	1,715	134	69,630	139	50,828	652,219
2044	\$ 652,219	1,544	72	69,042	126	49,475	634,142
2045	\$ 634,142	1,363	47	68,295	114	48,051	615,195

## Section VI – Accounting Information (continued)

Table 1 - Projection of Fiduciary Net Position (000's omitted) (continued)

Fiscal Year Ending 6/30	Beginning Fiduciary Net Position	Member Contributions	Employer Contributions	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Net Position
2046	\$ 615,195	1,194	36	67,331	102	46,568	595,560
2047	\$ 595,560	1,016	49	66,239	92	45,034	575,328
2048	\$ 575,328	857	71	64,968	82	43,461	554,668
2049	\$ 554,668	761	44	63,566	73	41,860	533,694
2050	\$ 533,694	659	25	62,170	66	40,233	512,376
2051	\$ 512,376	571	6	60,620	57	38,586	490,862
2052	\$ 490,862	485	-	59,034	50	36,925	469,189
2053	\$ 469,189	404	-	57,373	43	35,255	447,431
2054	\$ 447,431	335	-	55,620	36	33,582	425,691
2055	\$ 425,691	267	-	53,832	30	31,912	404,008
2056	\$ 404,008	213	-	51,934	24	30,251	382,514
2057	\$ 382,514	166	-	49,966	19	28,608	361,304
2058	\$ 361,304	125	-	47,944	15	26,991	340,461
2059	\$ 340,461	97	-	45,827	12	25,407	320,127
2060	\$ 320,127	73	-	43,687	9	23,865	300,368
2061	\$ 300,368	53	-	41,509	7	22,371	281,276
2062	\$ 281,276	34	-	39,347	5	20,929	262,888
2063	\$ 262,888	21	-	37,153	3	19,546	245,298
2064	\$ 245,298	10	-	34,963	2	18,226	228,568
2065	\$ 228,568	5	-	32,760	1	16,975	212,787
2066	\$ 212,787	3	-	30,575	0	15,800	198,014
2067	\$ 198,014	1	-	28,437	0	14,704	184,282
2068	\$ 184,282	-	0	26,355	0	13,688	171,616
2069	\$ 171,616	-	-	24,335	-	12,756	160,036
2070	\$ 160,036	-	-	22,396	-	11,907	149,548
2071	\$ 149,548	-	-	20,543	-	11,142	140,147
2072	\$ 140,147	-	-	18,785	-	10,460	131,823
2073	\$ 131,823	-	-	17,124	-	9,861	124,559
2074	\$ 124,559	-	-	15,565	-	9,342	118,337
2075	\$ 118,337	-	-	14,105	-	8,903	113,135



## Section VI – Accounting Information (continued)

Table 1 - Projection of Fiduciary Net Position (000's omitted) (continued)

Fiscal Year Ending 6/30	Beginning Fiduciary Net Position	Member Contributions	Employer Contributions	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Net Position
2076	\$ 113,135	-	-	12,744	-	8,541	108,932
2077	\$ 108,932	-	-	11,477	-	8,255	105,710
2078	\$ 105,710	-	-	10,303	-	8,045	103,452
2079	\$ 103,452	-	-	9,214	-	7,908	102,145
2080	\$ 102,145	-	-	8,207	-	7,843	101,782
2081	\$ 101,782	-	-	7,274	-	7,852	102,359
2082	\$ 102,359	-	-	6,412	-	7,932	103,880
2083	\$ 103,880	-	-	5,615	-	8,086	106,350
2084	\$ 106,350	-	-	4,881	-	8,313	109,782
2085	\$ 109,782	-	-	4,206	-	8,614	114,191
2086	\$ 114,191	-	-	3,589	-	8,992	119,593
2087	\$ 119,593	-	-	3,030	-	9,446	126,009
2088	\$ 126,009	-	-	2,528	-	9,980	133,460
2089	\$ 133,460	-	-	2,082	-	10,594	141,972
2090	\$ 141,972	-	-	1,692	-	11,290	151,569
2091	\$ 151,569	-	-	1,358	-	12,071	162,283
2092	\$ 162,283	-	-	1,075	-	12,940	174,148
2093	\$ 174,148	-	-	839	-	13,898	187,207
2094	\$ 187,207	-	-	647	-	14,951	201,511
2095	\$ 201,511	-	-	491	-	16,101	217,121
2096	\$ 217,121	-	-	367	-	17,355	234,110
2097	\$ 234,110	-	-	269	-	18,718	252,558
2098	\$ 252,558	-	-	194	-	20,197	272,561
2099	\$ 272,561	-	-	138	-	21,799	294,222
2100	\$ 294,222	-	-	96	-	23,534	317,661
2101	\$ 317,661	-	-	66	-	25,410	343,005
2102	\$ 343,005	-	-	44	-	27,439	370,400
2103	\$ 370,400	-	-	29	-	29,631	400,002
2104	\$ 400,002	-	-	19	-	31,999	431,982
2105	\$ 431,982	-	-	12	-	34,558	466,529

## Section VI – Accounting Information (continued)

Table 1 - Projection of Fiduciary Net Position (000's omitted) (continued)

Fiscal Year Ending 6/30	Beginning Fiduciary Net Position	Member Contributions	Employer Contributions	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Net Position
2106	\$ 466,529	-	-	8	-	37,322	503,843
2107	\$ 503,843	-	-	5	-	40,307	544,146
2108	\$ 544,146	-	-	3	-	43,532	587,674
2109	\$ 587,674	-	-	2	-	47,014	634,686
2110	\$ 634,686	-	-	1	-	50,775	685,460
2111	\$ 685,460	-	-	1	-	54,837	740,296
2112	\$ 740,296	-	-	0	-	59,224	799,520
2113	\$ 799,520	-	-	0	-	63,962	863,481
2114	\$ 863,481	-	-	0	-	69,078	932,559
2115	\$ 932,559	-	-	0	-	-	932,559

## Section VI – Accounting Information (continued)

**Table 2 - Actuarial Present Values of Projected Benefit Payments (000's omitted)**

Fiscal Year Ending 6/30	Beginning Fiduciary Net Position	Benefit Payments			Present Value of Benefit Payments		
		Benefit Payments	Funded Portion	Unfunded Portion	Funded Portion at 8.00%	Unfunded Portion at 3.20%	Using a Single Discount Rate of 8.00%
2017	\$ 352,478	\$ 44,357	\$ 44,357	\$ -	\$ 42,683	\$ -	\$ 42,683
2018	366,887	42,383	42,383	-	37,762	-	37,762
2019	385,358	43,985	43,985	-	36,286	-	36,286
2020	404,783	45,472	45,472	-	34,735	-	34,735
2021	425,601	46,982	46,982	-	33,229	-	33,229
2022	447,880	48,620	48,620	-	31,841	-	31,841
2023	470,773	50,152	50,152	-	30,411	-	30,411
2024	494,615	51,695	51,695	-	29,025	-	29,025
2025	519,518	53,365	53,365	-	27,743	-	27,743
2026	545,449	54,996	54,996	-	26,473	-	26,473
2027	572,596	56,702	56,702	-	25,272	-	25,272
2028	600,997	58,299	58,299	-	24,060	-	24,060
2029	631,029	59,877	59,877	-	22,880	-	22,880
2030	662,916	61,302	61,302	-	21,690	-	21,690
2031	697,058	62,719	62,719	-	20,547	-	20,547
2032	733,702	64,015	64,015	-	19,419	-	19,419
2033	761,272	65,262	65,262	-	18,330	-	18,330
2034	759,786	66,375	66,375	-	17,262	-	17,262
2035	756,576	67,381	67,381	-	16,226	-	16,226
2036	751,613	68,451	68,451	-	15,262	-	15,262
2037	744,634	69,174	69,174	-	14,281	-	14,281
2038	735,905	69,770	69,770	-	13,337	-	13,337
2039	725,473	70,155	70,155	-	12,417	-	12,417
2040	713,453	70,282	70,282	-	11,518	-	11,518
2041	700,032	70,234	70,234	-	10,658	-	10,658
2042	685,301	70,047	70,047	-	9,842	-	9,842
2043	669,312	69,630	69,630	-	9,059	-	9,059
2044	652,219	69,042	69,042	-	8,317	-	8,317
2045	634,142	68,295	68,295	-	7,618	-	7,618

## Section VI – Accounting Information (continued)

Table 2 - Actuarial Present Values of Projected Benefit Payments (000's omitted) (continued)

Fiscal Year Ending 6/30	Beginning Fiduciary Net Position	Benefit Payments			Present Value of Benefit Payments		
		Benefit Payments	Funded Portion	Unfunded Portion	Funded Portion at 8.00%	Unfunded Portion at 3.20%	Using a Single Discount Rate of 8.00%
2046	615,195	67,331	67,331	-	6,954	-	6,954
2047	595,560	66,239	66,239	-	6,334	-	6,334
2048	575,328	64,968	64,968	-	5,752	-	5,752
2049	554,668	63,566	63,566	-	5,211	-	5,211
2050	533,694	62,170	62,170	-	4,719	-	4,719
2051	512,376	60,620	60,620	-	4,261	-	4,261
2052	490,862	59,034	59,034	-	3,842	-	3,842
2053	469,189	57,373	57,373	-	3,457	-	3,457
2054	447,431	55,620	55,620	-	3,103	-	3,103
2055	425,691	53,832	53,832	-	2,781	-	2,781
2056	404,008	51,934	51,934	-	2,484	-	2,484
2057	382,514	49,966	49,966	-	2,213	-	2,213
2058	361,304	47,944	47,944	-	1,966	-	1,966
2059	340,461	45,827	45,827	-	1,740	-	1,740
2060	320,127	43,687	43,687	-	1,536	-	1,536
2061	300,368	41,509	41,509	-	1,351	-	1,351
2062	281,276	39,347	39,347	-	1,186	-	1,186
2063	262,888	37,153	37,153	-	1,037	-	1,037
2064	245,298	34,963	34,963	-	904	-	904
2065	228,568	32,760	32,760	-	784	-	784
2066	212,787	30,575	30,575	-	677	-	677
2067	198,014	28,437	28,437	-	583	-	583
2068	184,282	26,355	26,355	-	501	-	501
2069	171,616	24,335	24,335	-	428	-	428
2070	160,036	22,396	22,396	-	365	-	365
2071	149,548	20,543	20,543	-	310	-	310
2072	140,147	18,785	18,785	-	262	-	262
2073	131,823	17,124	17,124	-	221	-	221
2074	124,559	15,565	15,565	-	186	-	186
2075	118,337	14,105	14,105	-	156	-	156

## Section VI – Accounting Information (continued)

Table 2 - Actuarial Present Values of Projected Benefit Payments (000's omitted) (continued)

Fiscal Year Ending 6/30	Beginning Fiduciary Net Position	Benefit Payments			Present Value of Benefit Payments		
		Benefit Payments	Funded Portion	Unfunded Portion	Funded Portion at 8.00%	Unfunded Portion at 3.20%	Using a Single Discount Rate of 8.00%
2076	113,135	12,744	12,744	-	131	-	131
2077	108,932	11,477	11,477	-	109	-	109
2078	105,710	10,303	10,303	-	91	-	91
2079	103,452	9,214	9,214	-	75	-	75
2080	102,145	8,207	8,207	-	62	-	62
2081	101,782	7,274	7,274	-	51	-	51
2082	102,359	6,412	6,412	-	41	-	41
2083	103,880	5,615	5,615	-	34	-	34
2084	106,350	4,881	4,881	-	27	-	27
2085	109,782	4,206	4,206	-	22	-	22
2086	114,191	3,589	3,589	-	17	-	17
2087	119,593	3,030	3,030	-	13	-	13
2088	126,009	2,528	2,528	-	10	-	10
2089	133,460	2,082	2,082	-	8	-	8
2090	141,972	1,692	1,692	-	6	-	6
2091	151,569	1,358	1,358	-	4	-	4
2092	162,283	1,075	1,075	-	3	-	3
2093	174,148	839	839	-	2	-	2
2094	187,207	647	647	-	2	-	2
2095	201,511	491	491	-	1	-	1
2096	217,121	367	367	-	1	-	1
2097	234,110	269	269	-	1	-	1
2098	252,558	194	194	-	-	-	-
2099	272,561	138	138	-	-	-	-
2100	294,222	96	96	-	-	-	-
2101	317,661	66	66	-	-	-	-
2102	343,005	44	44	-	-	-	-
2103	370,400	29	29	-	-	-	-
2104	400,002	19	19	-	-	-	-
2105	431,982	12	12	-	-	-	-

## Section VI – Accounting Information (continued)

Table 2 - Actuarial Present Values of Projected Benefit Payments (000's omitted) (continued)

Fiscal Year Ending 6/30	Beginning Fiduciary Net Position	Benefit Payments	Benefit Payments		Present Value of Benefit Payments		
			Funded Portion	Unfunded Portion	Funded Portion at 8.00%	Unfunded Portion at 3.20%	Using a Single Discount Rate of 8.00%
2106	466,529	8	8	-	-	-	-
2107	503,843	5	5	-	-	-	-
2108	544,146	3	3	-	-	-	-
2109	587,674	2	2	-	-	-	-
2110	634,686	1	1	-	-	-	-
2111	685,460	1	1	-	-	-	-
2112	740,296	0	0	-	-	-	-
2113	799,520	0	0	-	-	-	-
2114	863,481	0	0	-	-	-	-
2115	932,559	0	0	-	-	-	-
<b>Total</b>					<u>\$ 694,198</u>	<u>\$ -</u>	<u>\$ 694,198</u>

## Schedule A - Actuarial Assumptions and Methods

### Valuation Interest Rate

8.00% per annum, compounded annually, net of expenses. The long-term expected rate of return on Fund investments was determined using best-estimate ranges of expected future nominal rates of return (expected returns, net of investment expense and inflation) developed for each major asset class using an econometric model that forecasts a variety of economic environments and then calculates asset class returns based on functional relationships between the economic variables and the asset classes.

### Separations from Active Service

Representative values of the assumed annual rates of withdrawal and vesting, disability, death and service retirement are as follows:

#### General Employees-Annual Rates of

Age	Disability	Service Retirement	
		Male	Female
25	.02%		
30	.03		
35	.06		
40	.10		
45	.15		
50	.19	1.0%	1.5%
55	.24	2.0	5.5
60	.28	12.0	5.0
62	.30	30.0	15.0
65	.30	40.0	15.0
69		30.0	20.0

Years of Service	Salary Scale
0	6.00%
1	5.50
2	5.50
3	5.00
4	5.00
5	4.50
6	4.50
7	4.00
8	4.00
9+	3.75

Years of Service	Rates of Withdrawal
0	15.0%
1	12.0%
2	10.0%
3	9.0%
4	8.0%
5	7.6%
10	5.4%
15	3.3%
20	2.0%
25	1.0%
30+	0.0%

#### Police and Fire-Annual Rates of

Age	Disability	Service Retirements
25	0.20%	
30	0.30	
35	0.30	
40	0.30	
45	1.00	1.0%
50	1.25	2.0
55	1.20	15.0
60	0.85	20.0
62	0.75	25.0
65	0.00	100.0
69		

Years of Service	Salary Scale
0	7.00%
1	6.50
2	6.00
3	5.50
4	5.00
5	5.00
6	4.50
7	4.50
8+	4.25

Years of Service	Rates of Withdrawal
0	1.5%
1	1.5
2	1.5
3	1.5
4	1.5
5	1.5
6	1.5
7	1.5
8	1.5
9	1.5
10	1.5
11+	0.0

## Schedule A - Actuarial Assumptions and Methods (continued)

It is assumed that 80% of all deaths are ordinary (20% are service connected). In addition, it is assumed for the general employees that 40% of all disabilities are ordinary (60% are service connected). For police and fire employees, 10% of all disabilities are assumed to be ordinary (90% are service connected). A load was applied to the accidental disability liability to account for the additional benefit payable for each dependent child upon the member's disability. Loads of approximately 2% and 11.7% were developed for Group 1 and Group 4, respectively, taking into account the higher likelihood of Group 4 accidental disabilities at younger ages, thus the likelihood of Group 4 having more dependent children than Group 1 accidental disability retirees.

These assumptions are commonly used throughout the Massachusetts Public Pension Systems and were selected for this plan since its employees are of similar demographic composition to those in other systems.

### Cost-of-Living Adjustments

Retirement benefits were assumed to increase annually at the assumed inflation rate of 3.00%, up to a maximum of \$360. The inflation assumption was developed in the same analysis that supported the valuation interest rate.

### Mortality

It is assumed that healthy mortality is represented by the RP-2000 Mortality Table projected generationally with Scale BB for males and females. Mortality for disabled members is represented by the RP-2000 Mortality Table set forward two years for all disabled members. This assumption was selected since it is commonly used throughout the Massachusetts Public Pension Systems.

### Form of Payment

Future retirees are assumed to elect a Life Annuity. Future vested terminations are assumed to elect a refund of contributions.

### Marital Percentage

80% of participants are assumed to be married at death. Husbands are assumed to be 3 years older than their wives.

### Loading or Contingency Reserve

None.

### Actuarial Cost Method

Individual entry-age normal cost method.

### Administrative Expenses

The normal cost is increased by an amount equal to the anticipated administrative expenses for the upcoming fiscal year. The amount for plan year 2016 is \$680,000 and is anticipated to increase at 4.0% per year.

### Asset Valuation Method

For funding calculation purposes, assets are valued according to the following general formula, provided such value is within a 20% corridor of the market value:

$$\begin{aligned}
 VA &= MV - .8I_1 - .6I_2 - .4I_3 - .2I_4 && \text{where} \\
 VA &= \text{Valuation assets.} \\
 MV &= \text{Market value of assets as of the valuation date.} \\
 I_n &= \text{Investment gain (loss) during } n^{\text{th}} \text{ year preceding the valuation date.}
 \end{aligned}$$

### GASB 67 and 68 Measurement Date

December 31, 2015.



## Schedule B - Summary of System Provisions

### Membership

The Retirement System covers all employees of participating units except teachers, elected officials and those employees in service at the time of its establishment who elected not to become members. Eligible employees in the City who enter service on or after the date the System became operative for their classification may become members of the Retirement System on their own application.

### Summary of Benefit and Contribution Provisions

A summary of the main benefit and contribution provisions of the Retirement System, as interpreted for the valuation, is presented below.

The terms "Group 1" and "Group 4" are used to denote "general employees" and "police and fire", respectively.

### Benefits

#### Final Average Salary (FAS)

For those hired prior to April 2, 2012, the average of a member's three highest consecutive years' compensation. For those hired on or after April 2, 2012, the average of a member's five highest consecutive years' compensation. For those hired on or after January 1, 2011, salary taken into account for benefit purposes is capped at 64% of the IRC Section 401(a)(17) limit (indexed).

#### Superannuation Retirement

##### Eligibility

For those hired prior to April 2, 2012: Age 65 for Group 1; Age 55 for Group 4. Maximum retirement age is 70 for Group 1 and 65 for Group 4.

For those hired on or after April 2, 2012: Age 67 for Group 1; Age 57 for Group 4 if member has completed 30 years of service, or age 62 otherwise.

##### Allowance

2.5% per year of service times FAS. Maximum total allowance is 80% of FAS. Veterans receive additional \$15 annually per year of service to a maximum of \$300 annually.

#### Early Retirement

##### Eligibility

20 years of service, or age 55 with 10 years of service. Group 1 members hired after April 1, 2012 are eligible upon the attainment of age 60 and 10 years of service.

##### Allowance

Calculated as a superannuation retirement allowance (including veteran's benefits) except accrual rate is equal to 2.5% reduced by .1% for each year age at retirement is below either 65 for Group 1 or 55 for Group 4. If hired after April 1, 2012, the accrual rate of 2.5% is reduced by .15% for each year age at retirement precedes age 67 for Group 1 or age 57 for Group 4 (age 62 if service at retirement is less than 30 years).

The minimum allowance after 30 years of service is equal to:

- (1) An annuity which is the actuarial equivalent of member's accumulated deductions; and
- (2) A pension equal to 1/3 of FAS and any veteran's benefits as described under superannuation retirement.

## Schedule B - Summary of System Provisions (continued)

### Vested Retirement

#### Eligibility

10 years of service. For certain involuntary terminations, this is reduced to 6 years.

#### Allowance

A superannuation retirement allowance commencing at age 55 for Group 1 members (age 60 if hired after April 1, 2012) and age 45 for Group 4 members (age 55 if hired after April 1, 2012) or later, where the accrual rate is determined by the age of the member at the time the allowance commences.

In lieu of the deferred pension benefit, a member may elect to receive a refund of their accumulated contributions. Members with ten or more years of service are entitled to 100% of the credited interest on their contributions. Members with five to ten years of service are entitled to 50% of the credited interest on their contributions. No credited interest is provided for members with less than five years of service.

### Ordinary Disability

#### Eligibility

10 years of service

#### Allowance

An immediate allowance equal to the age 55 rate for Group 1 members or age 45 rate for Group 4 members per year of service times FAS.

Veterans receive an allowance equal to:

- (1) An annuity which is the actuarial equivalent of their accumulated deductions; and
- (2) A pension which is the greater of 50% of current salary and the service retirement allowance to which they are eligible, if any.

### Accidental Disability

#### Eligibility

Permanent incapacity for further duty as a result of personal injury sustained while in the performance of duties.

#### Allowance

An immediate allowance equal to:

- (1) An annuity which is the actuarial equivalent of the member's accumulated deductions; and
- (2) A pension equal to 72% of current salary; and
- (3) A supplement equal to \$797.64 per year per child under 21.

The maximum total allowance is 100% of current salary.

### Accidental Death Benefit

#### Eligibility

Death due to an occupational injury.

#### Allowance

An immediate allowance equal to:

- (1) A lump sum payment equal to the accumulated deductions at death; and
- (2) A pension equal to 72% of current salary and payable to the surviving spouse, dependent children, or the dependent parents; and

## Schedule B - Summary of System Provisions (continued)

- (3) A supplement of \$312 per year per child payable to the spouse or legal guardian until all children reach age 21, unless handicapped.

The maximum total allowance is 100% of current salary.

### Death in Active Service

#### Eligibility

Death of a member due to a non-occupational injury.

#### Allowance

An immediate allowance that would have been payable had the member retired and elected the 2/3 joint and survivor option on the day before his death. For death occurring prior to the minimum superannuation retirement age, the age 55 (age 60 if hired after April 1, 2012) and age 45 (age 55 if hired after April 1, 2012) accrual rates are used, respectively, for Group 1 and Group 4 members.

For members with at least 2 years of service at death, the surviving spouse receives an additional allowance equal to the sum of \$1,440 per year for the first child and \$1,080 per year for each additional child.

The maximum total allowance is 100% of salary at the date of death.

### Normal Form of Benefit

Reduced modified cash refund annuity.

### Optional Forms of Benefit

- (1) Life annuity.
- (2) Modified cash refund annuity.
- (3) 66-2/3% joint and survivor allowance.

### Return of Contribution

If no other benefit is payable upon termination, the member's accumulated deductions are returned.

### Post-Retirement Adjustments

Up to 3% of the annual retirement allowance up to a maximum of \$360 annually.

### Member Contributions

Members contribute a percentage of annual regular compensation in accordance with their respective dates of hire, as shown below:

Date of Hire	Rate of Contribution
Prior to January 1, 1975	5%
On or after January 1, 1975	7%
On or after January 1, 1984	8%
On or after July 1, 1996	9%

Members hired on or after January 1, 1979 contribute an additional 2% of compensation in excess of \$30,000.

The contribution rate for Group 1 participants hired on or after April 2, 2012 and who attain 30 years of service is reduced by three percentage points.

## Schedule C - Membership Tables

Table 1 – Age/Service Distribution with Salary as of January 1, 2016

Attained Age	Average Salary										
	< 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total	
20-24	81	1								82	
	35,248	16,450								35,018	
25-29	119	13	1							133	
	33,289	45,242	52,616							34,602	
30-34	85	33	12							130	
	33,251	50,204	44,102							38,556	
35-39	68	42	42	13						165	
	34,596	55,083	74,972	83,835						53,968	
40-44	68	36	46	68	20					238	
	37,990	42,448	66,149	86,888	78,107					61,449	
45-49	65	36	46	62	37	12	2			260	
	34,981	34,538	52,415	74,544	85,620	85,055	102,638			57,476	
50-54	49	34	43	52	28	24	15			245	
	36,695	27,152	44,781	55,883	63,144	108,772	93,339			54,414	
55-59	36	31	40	71	21	23	15	11		248	
	34,855	43,271	41,441	45,332	60,362	90,919	110,645	88,234		54,280	
60-64	18	13	37	41	30	19	10	6	7	181	
	33,047	40,534	37,287	43,905	41,343	44,489	73,172	102,663	82,903	45,940	
65-69	7	3	6	11	6	9	3	3	3	51	
	32,263	69,854	36,047	36,840	47,834	62,606	77,283	61,014	69,313	49,612	
70+	3	3	4	2	3	2	2		4	23	
	40,186	20,401	23,671	15,285	44,340	101,631	108,240		70,335	49,614	
Total Employees	599	245	277	320	145	89	47	20	14	1,756	
Average Salary	34,802	42,484	52,196	62,439	65,007	82,408	94,576	88,480	76,400	51,104	

## Schedule C - Membership Tables (continued)

**Table 2 - The Number and Annual Pensions of Retired Members Distributed by Age as of January 1, 2016**

Age	Service Retirements		Disability Retirements		Beneficiaries	
	Number	Annual Pension	Number	Annual Pension	Number	Annual Pension
Under 20	0	0	0	0	0	0
20 - 24	0	0	0	0	1	276
25 - 29	0	0	1	14,073	0	0
30 - 34	0	0	0	0	0	0
35 - 39	0	0	1	38,327	2	32,076
40 - 44	0	0	6	242,717	0	0
45 - 49	0	0	13	757,122	3	81,789
50 - 54	5	148,867	12	652,038	2	35,721
55 - 59	24	624,884	12	561,640	10	172,194
60 - 64	82	3,231,493	25	1,254,541	9	119,474
65 - 69	212	8,199,294	34	1,732,546	29	688,209
70 - 74	182	5,915,044	38	1,801,733	24	617,208
75 - 79	131	3,373,201	19	867,108	22	441,550
80 - 84	118	2,748,630	16	624,946	35	513,038
85 - 89	85	1,413,652	6	219,052	37	655,189
90 - 94	39	496,237	3	84,202	19	268,372
95 - 99	7	40,919	1	56,546	4	68,341
100 and over	1	10,838	0	0	0	0
<b>Total</b>	<b>886</b>	<b>26,203,059</b>	<b>187</b>	<b>8,906,591</b>	<b>197</b>	<b>3,693,437</b>

## Schedule D - Valuation Results by Group - Breakouts

	Total	All Others/City of Brockton	Brockton Redevelopment Authority	Brockton Housing Authority	Brockton Area Transit
(1) Participants					
(a) Actives	1,756	1,679	4	65	8
(b) Retirees and Beneficiaries	1,083	1,034	4	44	1
(c) Vested	0	0	0	0	0
(d) Inactive (Refund)	502	495	2	4	1
(e) Disabled Retirees	<u>187</u>	<u>183</u>	<u>1</u>	<u>3</u>	<u>0</u>
(f) Total	3,528	3,391	11	116	10
(2) Payroll of Active Participants	89,738,426	85,259,255	248,574	3,734,913	495,684
Percent of Total Payroll	100.00%	95.01%	0.28%	4.16%	0.55%
(3) Normal Cost					
(a) Total Normal Cost	13,252,326	12,717,420	34,566	444,830	55,510
(b) Expected Employee Contributions	7,950,691	7,553,843	22,023	330,908	43,917
(c) Administrative Expenses	<u>680,000</u>	<u>652,553</u>	<u>1,774</u>	<u>22,825</u>	<u>2,848</u>
(d) Net Employer Normal Cost (a) - (b) + (c)	5,981,635	5,816,130	14,317	136,747	14,441
(4) Actuarial Accrued Liability	590,910,301	565,008,970	1,241,054	22,736,721	1,923,556
(5) Assets*	<u>380,329,008</u>	<u>370,322,842</u>	<u>448,531</u>	<u>8,217,314</u>	<u>1,340,321</u>
(6) Unfunded Actuarial Accrued Liability (4) - (5)	210,581,293	194,686,128	792,523	14,519,407	583,235
(7) Amortization of unfunded accrued liability	14,452,261	13,361,370	54,391	996,472	40,028
(8) ERI	69,703	0	0	69,703	0
(9) Total Required Employer Contributions (3d) + (7) + (8)	20,503,599	19,177,500	68,708	1,202,922	54,469
(10) Fiscal 2017 Cost	21,207,788	19,692,242	123,616	1,346,579	45,351
(11) Fiscal 2017 Cost - Assuming late payment for Housing	21,261,651	19,692,242	123,616	1,400,442	45,351
(12) Percentage of total	100.00%	92.85%	0.58%	6.35%	0.21%
2018 Normal Cost	6,151,322	5,981,121	14,723	140,627	14,851
2018 ERI	69,703	0	0	69,703	0
2018 Amortization of unfunded accrued liability	17,857,460	16,509,537	67,206	1,231,258	49,459
(13) Fiscal 2018 Cost	25,014,425	23,364,307	85,143	1,498,142	66,833
(14) Fiscal 2018 Cost - Assuming late payment for Housing	25,074,351	23,364,307	85,143	1,558,068	66,833
(15) Percentage of total	100.00%	93.40%	0.34%	5.99%	0.27%

\* Allocation of assets based on the ratio of the Actuarial Accrued Liability, adjusted by a credit of \$166,122,062 for the City of Brockton and the 1/1/2008 transfer of assets for the BAT of \$264,995. See page 30 for more detail on this allocation.

## Schedule D - Valuation Results by Group – Breakouts (continued)

### Allocation of Assets for Breakouts Exhibit

(1) City of Brockton Credit	
(a) Bond issued 12/1/2005	\$100,000,000
(b) 2005 contribution shortfall	(3,143,836)
(c) Credit as of 1/1/2006 (one month of interest at 6.67%)	97,394,772
(d) Credit as of 1/1/2007 (interest at 12.55%)	109,617,816
(e) Credit as of 1/1/2008 (interest at 7.01%)	117,302,025
(f) Credit as of 1/1/2009 (interest at -29.26%)	82,979,452
(g) Credit as of 1/1/2010 (interest at 23.60%)	102,562,603
(h) Credit as of 1/1/2011 (interest at 13.46%)	116,367,529
(i) Credit as of 1/1/2012 (interest at 0.10%)	116,483,897
(j) Credit as of 1/1/2013 (interest at 12.27%)	130,776,471
(k) Credit as of 1/1/2014 (interest at 12.42%)	147,018,909
(l) Credit as of 1/1/2015 (interest at 6.12%)	156,016,466
(m) Credit as of 1/1/2016 (interest at -1.32%)	153,957,049
(n) Total Brockton Market Value of Assets as of 1/1/2016	352,477,755
(o) Total Brockton Actuarial Value of Assets as of 1/1/2016	380,329,008
(p) Actuarial Value of Assets allocated to City of Brockton Credit (m) x (o) / (n)	166,122,062
(2) BAT Actuarial Value of Assets	
(a) BAT Market Value of Assets as of 1/1/2008	\$264,995
(b) End of year employer contribution	40,000
(c) Mid-year employee contributions	28,609
(d) Interest at -29.26%	(82,084)
(e) BAT Market Value of Assets as of 1/1/2009	251,520
(f) End of year employer contribution	83,217
(g) Mid-year employee contributions	32,105
(h) Interest at 23.60%	62,947
(i) BAT Market Value of Assets as of 1/1/2010	429,788
(j) End of year employer contribution	83,384
(k) Mid-year employee contributions	33,785
(l) Interest at 13.46%	60,051
(m) BAT Market Value of Assets as of 1/1/2011	607,009
(n) End of year employer contribution	50,758
(o) Mid-year employee contributions	33,332
(p) Interest at 0.10%	624
(q) BAT Market Value of Assets as of 1/1/2012	691,723
(r) End of year employer contribution	53,411
(s) Mid-year employee contributions	33,857
(t) Interest at 12.27%	86,891
(u) BAT Market Value of Assets as of 1/1/2013	865,882
(v) End of year employer contribution	48,553

## Schedule D - Valuation Results by Group – Breakouts (continued)

### Allocation of Assets for Breakouts Exhibit (continued)

(w) Mid-year employee contributions	26,164
(x) Interest at 12.42%	109,120
(y) BAT Market Value of Assets as of 1/1/2014	1,049,719
(z) End of year employer contribution	42,348
(aa) Mid-year employee contributions	27,211
(ab) Interest at 6.12%	65,063
(ac) BAT Market Value of Assets as of 1/1/2015	1,184,341
(ad) End of year employer contribution	45,351
(ae) Mid-year employee contributions	28,299
(af) Interest at -1.32%	(15,821)
(ag) BAT Market Value of Assets as of 1/1/2016	1,242,170
(ah) BAT Actuarial Value of Assets as of 1/1/2016 (ag) x (1o) / (1n)	<b>1,340,321</b>
(3) Actuarial Value of Assets remaining after City of Brockton Credit and BAT are excluded	
(a) Total Brockton Actuarial Value of Assets as of 1/1/2016	\$380,329,008
(b) City of Brockton Credit (1p)	166,122,062
(c) Actuarial Value of Assets allocated to BAT (2ad)	<u>1,340,321</u>
(d) Remaining AVA (a) - (b) - (c)	212,866,625
(4) BRA Actuarial Value of Assets	
(a) BRA Accrued Liability as of 1/1/2016	\$1,241,054
(b) Total non-BAT Accrued Liability as of 1/1/2016	588,986,745
(c) BRA Actuarial Value of Assets (3d) x (a) / (b)	<b>448,531</b>
(5) BHA Actuarial Value of Assets	
(a) BHA Accrued Liability as of 1/1/2016	\$22,736,721
(b) Total non-BAT Accrued Liability as of 1/1/2016	588,986,745
(c) BHA Actuarial Value of Assets (3d) x (a) / (b)	<b>8,217,314</b>
(6) City of Brockton Actuarial Value of Assets	
(a) Total Actuarial Value of Assets as of 1/1/2016	\$380,329,008
(b) BAT Actuarial Value of Assets as of 1/1/2016 (2ah)	1,340,321
(c) BRA Actuarial Value of Assets as of 1/1/2016 (4c)	448,531
(d) BHA Actuarial Value of Assets as of 1/1/2016 (5c)	8,217,314
(e) City of Brockton Actuarial Value of Assets as of 1/1/2016 (a) - (b) - (c) - (d)	<b>370,322,842</b>



## Schedule E - Projection of Expected Pension Payments

Year	Amount	Year	Amount
2016	\$ 44,355,403	2041	\$ 69,923,009
2017	42,372,640	2042	69,507,445
2018	43,966,350	2043	68,920,776
2019	45,445,155	2044	68,175,825
2020	46,945,682	2045	67,213,720
2021	48,575,822	2046	66,124,401
2022	50,099,270	2047	64,856,313
2023	51,634,950	2048	63,457,455
2024	53,297,463	2049	62,064,306
2025	54,920,749	2050	60,517,980
2026	56,619,672	2051	58,935,925
2027	58,210,834	2052	57,279,354
2028	59,782,326	2053	55,530,243
2029	61,202,570	2054	53,746,116
2030	62,614,352	2055	51,851,591
2031	63,906,321	2056	49,888,128
2032	65,148,731	2057	47,869,977
2033	66,259,128	2058	45,758,159
2034	67,262,296	2059	43,622,246
2035	68,330,189	2060	41,448,619
2036	69,051,556	2061	39,290,617
2037	69,645,778	2062	37,100,584
2038	70,029,755	2063	34,914,663
2039	70,156,403	2064	32,715,075
2040	70,108,758	2065	30,533,827

## Schedule F - GASB 68 Information

1. The determination of the average expected remaining service lives of all members, as follows:

Group	Remaining Service Lives		Average
	Number	Service	
Retired paid from fund	1,270	0	
Terminated with deferred benefit	502	0	
Active	<u>1,756</u>	<u>19,345</u>	
Total	3,528	19,345	5.48

2. The determination of pension expense for the fiscal year as shown below:

Pension Expense	Fiscal Year Ending June 30, 2016
Service Cost	\$ 11,641,512
Interest Cost on Total Pension Liability	44,359,746
Differences between Expected and Actual Experience	2,084,900
Changes of Assumptions	3,035,692
Contributions-Member	(8,302,780)
Projected Earnings on Plan Investments	(29,290,146)
Differences between Projected and Actual Earnings	9,989,664
Administrative Expenses	686,453
Other	798,475
Total Pension Expense	\$ 35,003,516

3. The schedule of changes in Net Pension Liability:

Change in Net Pension Liability	Fiscal Year Ending June 30, 2016
Net pension liability at June 30, 2015	\$ 189,510,504
Changes for the year:	
Service Cost	11,641,512
Interest Cost of Total Pension Liability	44,359,746
Projected Earnings on Plan Investments	(29,290,146)
Contributions-Employer	(19,247,619)
Contributions-Member	(8,302,780)
Administrative Expenses	686,453
Plan Changes	-
Deferred Inflows/(Outflows)	
Changes in Assumptions	-
Differences between Expected and Actual Liability Experience	11,431,816
Difference between Projected and Actual Earnings	36,844,585
Other	798,475
Net Change in Net Pension Liability	48,922,042
Net pension liability at June 30, 2016	\$238,432,546

## Schedule F - GASB 68 Information (continued)

4. Following is a schedule illustrating the recognition in pension expense of differences between expected and actual experience:

### Schedule of Difference between Actual and Expected Experience

Measurement Year:	2015	2016
Amount Established:	-	11,431,816
Recognition Period:	5.72	5.48
Annual Recognition:	-	2,084,900

#### Amount Recognized

2015	-	-
2016	-	2,084,900
2017	-	2,084,900
2018	-	2,084,900
2019	-	2,084,900
2020	-	2,084,900
2021	-	1,007,316
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-

#### Deferred Balance

2015	-	-
2016	-	9,346,916
2017	-	7,262,016
2018	-	5,177,116
2019	-	3,092,216
2020	-	1,007,316
2021	-	-
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-

## Schedule F - GASB 68 Information (continued)

5. Following is a schedule illustrating the recognition in pension expense of changes in assumptions:

### Schedule of Changes in Assumptions

Measurement Year:	2015	2016
Amount Established:	17,356,197	-
Recognition Period:	5.72	5.48
Annual Recognition:	3,035,692	-

#### Amount Recognized

2015	3,035,692	-
2016	3,035,692	-
2017	3,035,692	-
2018	3,035,692	-
2019	3,035,692	-
2020	2,177,737	-
2021	-	-
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-

#### Deferred Balance

2015	14,320,505	-
2016	11,284,813	-
2017	8,249,121	-
2018	5,213,429	-
2019	2,177,737	-
2020	-	-
2021	-	-
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-

## Schedule F - GASB 68 Information (continued)

6. Following is a schedule illustrating the recognition in pension expense of differences between projected and actual earnings on pension plan investments:

### Schedule of Differences between Projected and Actual Earnings

Measurement Year:	2015	2016
Amount Established:	13,103,736	36,844,585
Recognition Period:	5.00	5.00
Annual Recognition:	2,620,747	7,368,917
Amount Recognized		
2015	2,620,747	-
2016	2,620,747	7,368,917
2017	2,620,747	7,368,917
2018	2,620,747	7,368,917
2019	2,620,748	7,368,917
2020	-	7,368,917
2021	-	-
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-
Deferred Balance		
2015	10,482,989	-
2016	7,862,242	29,475,668
2017	5,241,495	22,106,751
2018	2,620,748	14,737,834
2019	-	7,368,917
2020	-	-
2021	-	-
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-

## Schedule G - Net Pension Liability Allocations as of June 30, 2015 and June 30, 2016 by Employer

Employer Name	Fiscal Year Ended June 30, 2015		Fiscal Year Ended June 30, 2016				
	Employer Proportion	Net Pension Liability	Employer Proportion	Proportionate Share of Total Contributions	Net Pension Liability	Net Pension Liability: 1% Decrease	Net Pension Liability: 1% Increase
All Others/City of Brockton	93.0288%	169,850,096	92.8538%	17,945,220	221,393,735	278,408,735	172,762,831
Brockton Redevelopment Authority	0.5597%	1,021,861	0.5829%	107,963	1,389,776	1,747,682	1,084,501
Brockton Housing Authority	6.1920%	11,305,243	6.3495%	1,194,436	15,139,168	19,037,921	11,813,728
Brockton Area Transit	0.2195%	400,820	0.2138%	42,348	509,867	641,172	397,871
<b>Total</b>	<b>100.0000%</b>	<b>\$ 189,510,504</b>	<b>100.0000%</b>	<b>\$ 19,289,967</b>	<b>\$ 238,432,546</b>	<b>\$ 299,835,510</b>	<b>\$ 186,058,931</b>

## Schedule H - Allocations of Pension Amounts as of June 30, 2016 by Employer

Deferred Outflows of Resources							
Employer Name	Employer Proportion	Net Pension Liability	Difference Between Expected and Actual Experience	Changes in Assumptions	Changes in Benefits	Difference Between Projected and Actual Investment Earnings	Changes in Proportional Share Of Contributions
All Others/City of Brockton	92.8538%	221,393,735	8,678,969	10,478,380	0	34,669,677	0
Brockton Redevelopment Authority	0.5829%	1,389,776	54,481	65,777	0	217,635	35,917
Brockton Housing Authority	6.3495%	15,139,168	593,478	716,524	0	2,370,754	243,974
Brockton Area Transit	0.2138%	509,867	19,988	24,132	0	79,844	0
<b>Total</b>	<b>100.0000%</b>	<b>\$ 238,432,546</b>	<b>\$ 9,346,916</b>	<b>\$ 11,284,813</b>	<b>\$ 0</b>	<b>\$ 37,337,910</b>	<b>\$ 279,891</b>

Deferred Inflows of Resources						
Employer Name	Difference Between Expected and Actual Experience	Changes in Assumptions	Changes in Benefits	Difference Between Projected and Actual Investment Earnings	Changes in Proportional Share Of Contributions	Difference Between Employer Contributions and Proportionate Share of Total Contributions
All Others/City of Brockton	0	0	0	0	271,123	
Brockton Redevelopment Authority	0	0	0	0	0	
Brockton Housing Authority	0	0	0	0	0	
Brockton Area Transit	0	0	0	0	8,768	
<b>Total</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 0</b>	<b>\$ 279,891</b>	<b>\$ 0</b>

## Schedule H - Allocations of Pension Amounts as of June 30, 2016 by Employer (continued)

Employer Name	Pension Expense Recognized		
	Proportionate Share of Pension Plan Expense	Change in Proportional Share Of Contributions	Total
All Others/City of Brockton	32,502,102	(60,476)	32,441,626
Brockton Redevelopment Authority	204,029	8,012	212,041
Brockton Housing Authority	2,222,533	54,420	2,276,953
Brockton Area Transit	74,852	(1,956)	72,896
Total	<b>\$ 35,003,516</b>	<b>\$ 0</b>	<b>\$ 35,003,516</b>



## Schedule I - Employers' Proportionate Share of the June 30, 2016 Deferred Outflows/Inflows

Employer Name	June 30, 2017	June 30, 2018	June 30, 2019	June 30, 2020	Thereafter	Total
All Others/City of Brockton	14,056,890	14,056,890	14,056,891	10,820,695	937,094	53,928,460
Brockton Redevelopment Authority	84,572	84,572	84,572	65,102	5,638	324,456
Brockton Housing Authority	935,627	935,627	935,627	720,226	62,373	3,589,480
Brockton Area Transit	33,167	33,167	33,167	25,531	2,211	127,243
<b>Total</b>	<b>\$ 15,110,256</b>	<b>\$ 15,110,256</b>	<b>\$ 15,110,257</b>	<b>\$ 11,631,554</b>	<b>\$ 1,007,316</b>	<b>\$ 57,969,639</b>